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ABSTRACT

To compare the effects of hypothesis testing strategy training and paired associate training on the verbal abstraction performance of mentally handicapped adolescents, 50 male educable mentally handicapped in residence at a state school were tested. Subjects receiving strategy-oriented training learned to test out associates against nouns that were part of an abstraction set to determine appropriate abstractions. Subjects receiving paired associate training memorized nouns along with associates that would serve as abstractions when nouns appeared as part of abstraction sets. Results showed that strategy-oriented training facilitated performance on transfer items and training items, while paired associate training improved training items only. The results of the strategy training program are discussed in light of other evidence supporting the efficacy of training retardates in mental processes which are appropriate for specific conceptual tasks. (CD)

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ABSTRACT

This study compared the effects of hypothesis testing strategy training and paired associate training on the verbal abstraction performance of mentally retarded adolescents. Subjects receiving strategy oriented training learned to "test out" associates against nouns that were part of an abstraction set to determine appropriate abstractions. Subjects receiving paired associate training memorized nouns along with associates that would serve as abstractions when the nouns appeared as part of abstraction sets. Strategy oriented training facilitated performance on transfer items and training items, while paired associate training improved performance on training items only.

EVALUATION OF A STRATEGY ORIENTED TRAINING PROGRAM ON THE VERBAL ABSTRACTION PERFORMANCE OF EDUCABLE RETARDATES*

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A number of studies dealing with the conceptual processes of retardates have been given impetus by psychological information theory (Spitz, 1966). According to the theory, concept formation is facilitated if the learner uses organizational strategies which enable him to order pieces of incoming information into meaningful classes. Recoding incoming stimuli into meaningful classes, in effect, reduces the stimulus complexity of the input by permitting the learner to deal with categories or classes of things rather than bits of information, Referring bits of information to some class of things or events is viewed as basic to the development of conceptual behavior which is the central or primary process involved in cognition (Gagne, 1965; Bruner, Goodnow, & Austin, 1956; Reichard, Schneider, & Rapaport, 1944).

In a study which provides insight into the role of input organization in the conceptual behavior of retardates, Griffith and Spitz (1958) reported that their subjects' success in reporting a similarity (dark) for a triad of words (night-cave-closet) was related to the definitions given these words on a separate word association task. Interestingly, they found that when subjects defined at least two of the words in a triad in terms of the common attribute, they were significantly more successful in attaining the concept than when they defined only one word in terms of the common abstraction. It was apparent that the subjects depended upon the majority of the

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words in the abstraction set to elicit a common response. If the subjects had been testing out hypotheses or associates against each word in the triad, only one word in each triad would have to be defined in terms of the abstraction for them to induce the correct concept. Testing out hypotheses may be viewed as a strategy which enables the learner to recode the stimulus information conveyed by a triad of words in order that a common element may be identified.

Support for the supposition that retardates are deficient in hypothesis testing ability was provided by Griffith, Spitz, and Lipman (1959). These investigators reported that equal MA normals (MA=9) were able to identify the concept in a triad of words even though they had only defined one word in common with the relevant abstraction. The authors suggested that the normals were apparently able to test all associates against the stimulus words to discover the concept.

Miller and Griffith (1961) provided further support for the finding that retardates' performance on a verbal abstraction task is improved if the majority of the words in an abstraction set elicit a common abstraction relevant associate. They found that by eliciting and reinforcing relevant associates to words in an abstraction set in a separate training session, abstraction performance could be improved. Improved abstraction performance, however, was limited to materials used in training. This was to be expected in as much as the training program did not involve the teaching of a strategy appropriate for the conceptual task.

The purpose of the present investigation was to investigate the efficacy of a training program designed to teach retardates a strategy for a verbal abstraction task. Specifically, the strategy training program required the subjects to learn how to test out associates for a verbal abstraction task.

Specifically, the strategy training program required the subjects to learn how to test out associates for a verbal abstraction task. A contrast training program required a comparable group of subjects to learn associates for a list of words that were used to construct a verbal abstraction task. Of particular interest was the question of whether a "strategy oriented" training program would result in generalization of performance to materials not used in training.

METHOD

Subjects

The subjects used in this study were 50 male educable mentally retarded adolescents in residence at a State School for the mentally retarded. The subjects' IQs ranged from 50-74 as measured by the Wechsler Intelligence Scale for Children. Their CAs ranged from 12.75 to 17.17. All subjects were able to use a pencil and copy words from an overhead projector screen.

Measuring Instruments

The first step in the experiment required that a pre-test of verbal abstracting ability be administered to all 50 subjects. The test was comprised of 30 triads of nouns (Table I), of which 10 were used in the training phase of the experiment. The remaining 20 triads of nouns served to provide a base line for measuring the effects of training on the post-test. These items were labeled transfer triads and were considered to be of moderate difficulty in that they were failed by 30-70% of a pilot group comparable to the experimental sample. The training triads were considered to be of greater difficulty in that they were failed by better than 60% of the subjects in the same pilot study.

Treatment Groups

The study included two experimental groups. One group received

hypothesis testing strategy training (HTST) and the other group received paired associate training (PAT). To insure that the HTST Group and the PAT Group would be comparable on abstracting performance, the total number of correct responses on the pre-test of verbal abstracting ability was totalled for each subject. Scores were then rank ordered from the highest to lowest and the 50 subjects were paired on the basis of test performance. A member of each pair was then randomly assigned to the HTST Group or the PAT Group which resulted in 25 subjects per treatment group. No pair of subjects differed by more than two points on pre-test performance. The mean IQ, CA, MA and pre-test scores of both groups are presented in Table II.

Training Sessions

Each treatment group was comprised of two separate classes of 12 and 13 subjects. Training sessions were scheduled for five days. The training schedule for the first day and the last day were identical; however, the schedules for the intervening three days were rotated so that each group received training at a different time. Each training session covered a period of 45 minutes. The training sessions were conduced by the experimenter and a member of the school teaching staff who served as an assistant to insure that individual members of the class were following instructions and completing training sessions.

Hypothesis Testing Strategy Training

During each training session, two training triads were randomly chosen to demonstrate the strategy of hypothesis testing. One triad at a time was projected on a screen for the entire class to view. Each subject was provided a work sheet with the triad, identical to the one on the screen, printed on the top. The following instructions were read to the subjects as they viewed the triad on the screen:

We are going to learn a way of discovering or finding out how

groups of words are alike or the same. Before we decide how these words are alike we are going to check our answers by by writing the word we think is right under each word in the group. You will see that there are blanks under each word for you to write your answer in. Let's try checking or testing a possible answer together. You write the answer under each word in the group as I do to see if it goes with each word in the group.

The experimenter then elicited responses from the class and chose some of the erroneous ones to demonstrate how they could be "tested out" by checking them against each word in the triad. For example, in working with the triad pill--mosquito--pin, the answer "they sting" was given as a possible similarity. As the class followed the experimenter by copying the response under each word in the set, they discovered that it was inappropriate for at least one of the words. The subjects were assisted in verbalizing that this response was not correct because it could not be written under the word pill. Other irrelevant responses given to the triad cited above were "they fly" or "they're all poisonous." These also were "tested out" and demonstrated to be incorrect. Subsequent to practicing the strategy with erroneous responses, an acceptable abstraction was selected. In the case cited above, the response "small" was written under each word in the triad pill--mosquito--pin. The experimenter demonstrated that as he wrote the answer under each word in the set we see that "it goes with this one," or "I can define this word using this one." The class followed the experimenter's examples by copying from the overhead screen. Individual subjects were asked to verbalize the process that was followed.

After the class had responded correctly to the first triad, the worksheets were collected and another passed out. The overhead projector was used again

to project the second training triad and identical instructions were given. The same procedure of using erroneous responses to illustrate how hypotheses are rejected was followed, and each subject was expected to copy the experimenter's examples and practice the strategy. The same procedure of practicing with two triads per day was followed on the remaining four days of training.

Paired Associate Training

For each of the 5 training sessions, a total of 6 nouns were selected from a random list of the 30 nouns that comprised the 10 training triads. Each noun was paired with an associate that would serve as the abstraction when the noun appeared as part of an abstraction set. Therefore, subjects learned a total of 30 nouns and their abstraction relevant associates over a 5-day period which provided them with the basis for identifying the similarity each training triad was designed to elicit. The overhead projector was used to present a pair of words at a time for the entire class to view. Each subject had a worksheet on which appeared the numbers one through six. Next to each number appeared two blank lines. The following instructions accompanied the presentation of the first pair of words:

> Now, we are going to learn some words that we will play a game with later. Here is the first pair of words (experimenter pointed to the words and read them for the class). Now, I want you to say this word (pointed to first of pair) and the word that goes with it (pointed to second word). Write both of these words on your paper next to the number. Try to remember that this word goes along with this word, because later I am going to show you just the first word and ask you to tell me which one goes with it.

After the first pair of words was shown on the screen, the remaining pairs were shown one at a time and similar instructions were given. As

expected, once the subjects followed the instructions several times, it was not necessary for the experimenter to read them at all. The subjects knew what their task was and copied the pair of words as soon as they were shown on the screen. Once all six pairs were copied and subjects were given one last opportunity to remember which words go together, their worksheets were collected. The experimenter and assistant evaluated each worksheet prior to collecting it to insure that the correct responses were made.

Subsequent to collecting all papers, blank worksheets identical to the first ones were distributed for the next phase of the training. The following instructions were given:

> Now we can play the game I told you about. If you are ready, I will tell you the rules of the game. I am going to show you a word on the screen. Altogether, I will show you six words. Write the word that goes with it. You will find the six words you will use for your answers on the board.

Whether subjects could read or spell the abstraction relevant associate was not important to the experiment. The associates for each training session were written randomly on the board for the subjects to choose from. If subjects had difficulty identifying the right word, they were instructed to raise their hand for assistance. If subjects could verbalize the correct associate, the assistant or experimenter helped him locate it on the board. A criterion level of three consecutive correct responses to each list of nouns per training session was chosen to insure learning and retention of the paired associates. This was accomplished by collecting all worksheets after it had been determined they were satisfactory, and passing out blank worksheets for a second trial and a final third trial. The order of presenting the nouns for each trial was randomized. Worksheets were collected after each trial

only after every paper had been checked individually by the experimenter or the assistant for errors. The subjects who made errors were asked individually to verbalize the appropriate associate and required to erase the incorrect response and replace it with the correct one.

Subsequent to the training program, a post-test identical to the pre-test was administered to all subjects. The order of the items on the post-test was randomized, and testing was completed by two members of the teaching staff at the State School who were not aware of the treatment individual subjects received.

RESULTS

The number of correct responses on training triads and on transfer triads served as the data for the analyses. A summary of these data is presented in Tables III and IV.

A series of *t* tests were applied to determine the effects of hypothesis testing strategy training and paired associate training on training triads and transfer triads by analyzing differences between pre-test and post-test means and mean change scores. The mean post-test score of 7.16 and 8.48 on the ten training triads for the PAT and the HTST Groups, respectively, reflect significant improvement over pre-test performance. While both training programs were effective in improving performance on training materials, the mean gain score of 6 for the HTST Group was significantly greater than the mean gain score of 4.32 for the PAT Group.

Of major importance was the finding that the HTST Group improved in performance on the post-test of transfer triads. The mean gain score for the HTST Group on transfer triads was 2.20 while the PAT Group showed no significant gain from pre-test to post-test on the same items.

DISCUSSION

The fact that the HTST Group demonstrated the capacity to use the strategy of hypothesis testing to determine the compatibility of a specific response (concept) with known data (triad) is of major importance. This suggests that retardates are capable of assuming a more active and deliberate role in solving problems of this type. Investigations by Katz (1962), Carter and McKinney (1966), and Bean (1968) are in agreement with the major finding of this study in that they demonstrated the efficacy of process oriented training programs on the conceptual performance of retardates. Noteworthy is the fact that the above studies, as well as the present investigation, were conducted under classroom conditions.

Evidence that the retarded can be trained to apply thinking strategies to solve conceptual tasks suggests that the present "modus operandi" in special classes should be re-examined. Specifically, it would appear that the emphasis in the special class curriculum should not be placed upon the manipulative memorization and over-learning of specific contents solely. That is, in addition to the traditional practice of having retarded students acquire specific learnings essential for independent living they can be expected to learn more independent approaches to dealing with conceptual tasks. Hopefully, retarded learners who have been trained in specific reasoning modes, as well as in the traditional content of the special class curriculum, would evidence improved adaptive behavior.

Unlike the HTST Group, the PAT Group did not generalize performance to the transfer materials. This finding is consistent with Miller's (1961) investigation. He reported that training retardates on associates for a verbal abstraction task did not affect performance on transfer items although

it did improve performance on training items. The inability of the PAT Group to show improvement on the post-test transfer items may be explained in terms of their training program which emphasized the learning of specific responses for a set of materials. Instruction did not focus on the thinking strategy or reasoning mode which was appropriate for the conceptual task.

Of interest was the finding that the mean change score of 6.00 for the HTST Group on training items was significantly higher than the mean change score of 4.32 for the PAT Group. Since the PAT Group had to memorize the nouns used in the abstraction sets, it was assumed the group would have the basis or information requisite for dealing with the task as successfully as the HTST Group. This supposition would appear sound in that Griffith and Spitz (1958) reported that the applying of a common abstraction relevant associate to all of the words in an abstraction set is almost certain to result in successful abstraction attainment. Furth and Milgram (1965) maintain, however, that increased specific word knowledge does not contribute to corresponding improvement in conceptual behavior. It is their view that the verbal skills demanded of subjects in a verbal abstraction task are somewhat independent of the conceptual operation required for the task. It would seem that the superior performance of the HTST Group on training and transfer materials was a function, therefore, of the conceptual operation the subjects learned. The fact that they learned to use an appropriate thinking strategy -- testing associates against all of the words in an abstraction set -- compensated for their relative inefficiency to rely on verbal elements alone in discovering the similarity.

SUMMARY

The present study was designed to investigate the efficacy of two train-

ing programs on the verbal abstraction of educable retardates. One training program was designed within an information theory framework and emphasized hypothesis testing strategy training (HTST). The strategy of hypothesis testing was viewed as an information processing technique. A contrast group received paired associate training (PAT) which involved the rote memorization of nouns that were used to construct abstraction sets along with associates that would serve as abstractions on a verbal abstraction task.

The HTST Group showed significant improvement on transfer items while the PAT Group demonstrated no improvement on the same items as a function of training. Of secondary importance, a comparison of the performance of both groups on training items revealed that each improved, though the HTST Group showed significantly higher gains than the PAT Group. The results of the strategy training program were discussed in light of other evidence that supports the efficacy of training retardates in mental processes which are appropriate for specific conceptual tasks.

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FOOTNOTES

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Table I

ABSTRACTION TEST

1. mouse - tiger - snake

answer _____

*2. ant - pebble - seed

answer _____

3. ball - dart - spear

answer _____

4. eyes - ears - nose

answer _____

5. rocket - bee - eagle

answer _____

*6. milk - cigarette - teeth

answer _____

7. tack - pin - thorn

answer _____

*8. canary - butter - banana

answer _____

9. stars - moon - lamp

answer _____

*10. cotton - silk - pillow

answer _____

11. night - cave - closet

answer _____

12. cabin - tree - bat

answer _____

13. elephant - mountain - whale

answer _____

14. dog - lion - cow

answer _____

15. peas - grass - spinach

answer _____

*16. pill - mosquito - pin

answer _____

17. thumb - mouth - leg

answer _____

*18. penny - wheel - apple

answer _____

19. ball - plate - button

answer _____

20. bush - tree - flower

answer _____

21. cabbage - skunk - garbage

answer _____

22. apple - cherry - blood

answer _____

*23. brush - crayon - pencil

answer _____

24. cartoon - joke - comic

answer _____

25. ice-cream - snow - winter

answer _____

*26. flower - dog - boy

answer _____

27. snow - egg - chalk

answer _____

*28. stone - helmet - steel

answer _____

*29. ocean - dinosaur - battleship

answer _____ _____

30. snow - cloud - sheet

answer _____

* training triads

Table II

COMPARISON OF CONTROL VARIABLES

		Hypothesis Testing Strategy Training Group (N=25)	Paired Associate Training Group (N=25)	t	p
CA	Mean	15.28	15.06	.622	NS
	S.D.	1.22	1.28		
	Range	12.92-17.00	12.75-17.17		
MA	Mean	9.66	9.21	1.30	NS
	S.D.	1.43	.99		
	Range	7.21-11.92	7.29-11.40		
IQ	Mean	63.08	61.40	.93	NS
	S.D.	6.23	6.52		
	Range	50-74	50-73		
Pre-Test Abstraction Score	Mean	15.00	14.92	.044	NS
	S.D.	6.34	6.38		
	Range	2-25	3-25		

Table III

COMPARISON OF PRE-TEST SCORES WITH POST-TEST SCORES

Paired Associate Training Subjects (N=25)

		Pre-test	Post-test	t*	p
Training Traids	Mean	2.8	7.16	12.53	<.01
	S.D.	1.92	2.38		
	Range	0-6	3-10		
Transfer Triads	Mean	12.12	12.32	.3137	NS
	S.D.	4.74	4.04		
	Range	3-19	4-18		

Strategy Training Subjects (N=25)

		Pre-test	Post-test	t	p
Training Triads	Mean	2.48	8.48	14.86	<.01
	S.D.	2.19	1.30		
	Range	0-7	6-10		
Transfer Triads	Mean	12.52	14.72	3.71	<.01
	S.D.	4.53	3.26		
	Range	2-19	5-20		

*t for correlated observations

Table IV

COMPARISON OF GAIN SCORES

		Strategy Training (N=25)	Paired Associate Training (N=25)	t	p
Training Triads	Mean	6.0	4.32	3.151	$<.01$
	S.D.	2.02	1.74		
	Range	(2)-(10)	(2)-(9)		
Transfer Triads	Mean	2.20	.2000	2.297	$<.025$
	S.D.	2.97	3,19		
	Range	(-2)-(11)	(-3)-(10)		